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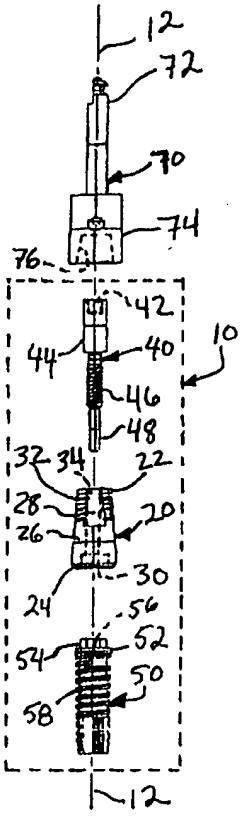
(54) Title: ABUTMENT-MOUNT SYSTEM FOR DENTAL IMPLANTS

(57) Abstract

An abutment-mount (20) for a dental implant (50) has a longitudinally extending axis (12) with a first end (22), an opposite second end (24), and a peripheral surface (26). The abutment-mount (20) is used for delivering the dental implant (50) to a prepared site of the jawbone with an implant drive tool (70) and is used for securing a dental prosthesis to the dental implant (50). The abutment-mount includes a screw (40), or other fastener for securing the abutment-mount (20) to the implant (50). A surface (32) is provided for attaching the dental prosthesis to the abutment-mount (20) adjacent the first end (22). A structure (28) is provided for transferring rotational force from the dental implant drive tool (70) to the implant (50) through the abutment-mount (20). An implant kit (10) includes an abutment-mount (20), an implant (50) and an abutment screw.



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ABUTMENT-MOUNT SYSTEM FOR DENTAL IMPLANTS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to skeletal implants (such as dental implants) and more particularly to a dental implant kit that provides an abutment that also acts as a mount.

2. Description of the Prior Art

Dental implants are used to provide a platform to which a dental prosthesis may be secured to underlying bone in the mandible or maxilla of a dental patient. A typical root form dental implant system employs a dental implant that is placed in a prepared site in the underlying bone. A disposable mount is used to provide a connection to an insertion tool used to place the implant into the bone. If the implant is a threaded implant, the mount is typically a removable extension of the implant that provides a hex nut-type suface for engagement with a socket used for screwing the implant into the prepared site. Once the implant is engaged in the site, the mount is removed and discarded. A cover screw is affixed to the top of the implant and the bone surrounding the prepared site is allowed to grow into the implant for several months, thereby securing the implant to the bone.

Once the surrounding bone has sufficiently engaged the implant, the cover screw is removed and an impression coping is affixed to the implant. An impression of the implant and the surrounding teeth is taken and a dental prosthesis is constructed using the impression as a model of the area of the patient's mouth surrounding the implant site. The dental prosthesis is then affixed to the abutment with cement, or other affixing means. Thus, the abutment acts as a platform for securing a dental prosthesis to the implant.

The current method is wasteful and costly because the mount is discarded and a separate abutment must be procured.

SUMMARY OF THE INVENTION

The present invention is an abutment-mount for a dental implant, having a longitudinally extending axis with a first end, an opposite second end and a peripheral surface. The abutment-mount is used for delivering the dental implant to a prepared site of a jawbone with an implant drive tool and is also used as a device for securing a dental prosthesis to the dental implant. The abutment-mount includes a screw, or other fastener, for securing the abutment-mount to the implant. A surface is provided for attaching the dental prosthesis to the abutment-mount adjacent the first end. A structure is provided for transferring rotational force from the implant drive tool to the implant through the abutment-mount.

In another aspect of the invention a groove, defined by the peripheral surface of the abutment-mount, is disposed circumferentially about the peripheral surface of the abutment-mount, thereby providing an attachment surface for cement used to affix the dental prosthesis to the abutment-mount adjacent the first end.

Yet another aspect of the invention is a dental implant kit for use with an implant drive tool. The kit includes a dental implant having a crestal end defining a first engagement surface. The kit also includes an abutment-mount, having a first end and an opposite second end, and a peripheral surface, the second end defining a second engagement surface matingly engageable with the first engagement surface, the peripheral surface defining a surface for engagement with the implant drive tool. The kit also includes a surface for securing the abutment-mount to the dental implant, thereby providing a platform for attachment of a dental prosthesis to the implant.

An additional aspect of the invention provides a method of deploying and using a dental implant in prepared site of a bone. The dental implant, having an abutment-

mount coupled to the dental implant that transfers any rotational force received by the abutment-mount to the dental implant, is placed into the prepared site. Rotational force is applied to the abutment-mount with an implant drive tool, thereby rotating the dental implant into the prepared site. The abutment-mount is removed from the dental implant for a preselected period to allow bone growth into the dental implant, thereby affixing the dental implant to the bone. The abutment-mount is re-coupled to the implant and is then secured to the dental implant. A dental prosthesis is then affixed to the abutment-mount.

In yet another aspect of the invention, longitudinal force is applied to the abutment-mount with an implant drive tool, thereby driving the dental implant into the prepared site.

One advantage of the invention is that the mount used to drive the implant into the prepared site is also used as an abutment for securing the prosthesis to the implant, thereby reducing the cost of implantation.

Another advantage of the invention is that it provides an abutment that can be secured in an impression material as part of a direct or indirect impression technique.

These and other advantages will become apparent from the following description of the preferred embodiment taken in conjunction with the following drawings, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts of the disclosure.

BRIEF DESCRIPTION OF THE FIGURES OF THE DRAWINGS

FIG. 1 is an exploded elevational view of an implant, an abutment-mount, an abutment screw and a socket for engaging the abutment-mount.

FIG. 2 is a top front perspective view of an abutment-mount and a socket.

FIG. 3 is a cross-sectional view of an implant kit packaged in a vial.

FIG. 4A is a partial cut-away elevational view of a first embodiment of a socket for use with a dental hand piece.

FIG. 4B is an elevational view of the socket of FIG. 4A engaged with an abutment-mount affixed to an implant.

FIG. 5 is a front elevational view of a second embodiment of a socket for use with a ratchet.

FIG. 6 is a top front perspective view of an implant and an abutment-mount using an elongated screw as part of a direct impression technique.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A preferred embodiment of the invention is now described in detail. Referring to the drawings, like numbers indicate like parts throughout the views. As used in the description herein and throughout the claims that follow, "a," "an," and "the" includes plural reference unless the context clearly dictates otherwise. Also, as used in the description herein and throughout the claims that follow, the meaning of "in" includes "in" and "on" unless the context clearly dictates otherwise. Also, "complimentary in shape" means generally having compatible dimensions, without necessarily having an identical shape.

As shown in FIGS. 1 and 2, the implant kit **10** of the present invention comprises a dental implant **50**, an abutment-mount **20** and an abutment screw **40**. The dental implant **50** may be one of several types, including the screw-type root-form dental implant shown. As show, the dental implant **50**, the abutment-mount **20** and the

abutment screw **40** are all aligned along a common axis **12**. The implant **50**, the abutment-mount **20** and abutment screw **40** would be made from a material suitable for implant applications, such as ASTM F-136 titanium alloy using a CNC machining process. As would be obvious to one skilled in the art, other materials and manufacturing processes may be employed without departing from the scope of the invention.

The abutment-mount **20** has a first end **22**, an opposite second end **24** and a peripheral surface **26**. At least one drive tool engagement surface **28** is provided for engagement with an implant drive tool **70**, such as a socket. The engagement surface **28** could be a flat chordal surface, as shown, or any other of the many types of drive tool engagement surfaces that are commonly known to the arts of fastener design and implantology (for example, an internal hex could be employed for engagement with an Allen wrench as a drive tool).

The implant **50** includes a crestal end **52** and a first rotational engagement surface **54** adjacent the crestal end **52**. The crestal end **52** defines a first longitudinal opening **56** with internal threads for receiving the abutment screw **40** therein. The abutment-mount **20** includes a second rotational engagement surface **30** that is complimentary in shape to the first rotational engagement surface **54**. The first rotational engagement surface **54** may be a male polygonal surface (such as a hexagonal protrusion) extending from the crestal end **52**, with the second rotational engagement surface **30** being a corresponding female engagement surface defined by the second end **24**. Similarly, the first rotational engagement surface **54** could be a female polygonal surface, while the second rotational engagement surface **30** is a corresponding male polygonal surface. As would be obvious, many other types of engagement surfaces (including non-polygonal surfaces) could be employed with satisfactory results.

The abutment-mount **20** may be provided with one or more grooves **32** defined by the peripheral surface **26** to provide additional surface area on the abutment-mount

20 for cementing a dental prosthesis (not shown) thereto and for retention of impression material. Because the abutment-mount 20 performs both the function of an abutment, for securing a prosthesis to the implant 50, and the function of a mount, for driving the implant 50 into a prepared bone site, the present invention avoids the cost of supplying an additional, non-reusable mount.

The abutment-mount 20 is fastened to the implant 50 with the abutment screw 40. The abutment screw 40 may include a head portion 44, a threaded portion 46 and a non-threaded alignment portion 48 for aligning the threads of the threaded portion 46 with the threads in the first longitudinal opening 56 of the implant 50. The head portion 44 defines an internal hex opening 42 for receiving a hex driver for screwing the abutment screw 40 into the first longitudinal opening 56 implant 50. The abutment-mount 20 defines a second longitudinal opening 34 passing therethrough, for receiving the abutment screw 40 therein. The second longitudinal opening 34 includes an enlarged top part 36 opening to the first end 22 and a narrowed part 38 opening to the second rotational engagement surface 30. The enlarged top part 36 has a diameter sufficient to receive the head portion 44 of the abutment screw 40, while the narrowed part 38 has a diameter sufficient to receive the threaded portion 46 of the abutment screw 40. The length of the enlarged part 36 is such that the head portion 44 is substantially flush with the first end 22 of the abutment-mount 20 when the abutment screw 40 and the abutment-mount 20 are properly affixed to the implant 50.

As shown in FIG. 3, the implant kit 10, including the implant 50, the abutment-mount 20 and cover screw 40 may be shipped together in a package 80 comprising a vial 82 and a cap 84. The vial 82 may be made of a plastic polymer, such as polyethylene, or any other suitable material commonly known to the art. At least one tab 90 extends outwardly from the cap 84 to prevent rolling of the package 80 when placed on a flat surface.

A detente **88** extends from the center of the inside surface of the cap **84**. The detente **88** is shaped to fit into the second longitudinal opening **34** of the abutment-mount **20**, so that the detentes **88** holds the kit **10** and prevents the threads **58** of the implant **50** from touching the inner surface of the vial **82**. This is especially important, because the threads may be coated with a coating, such as an apatite compound, that could flake is touched by the vial **82**. The abutment screw **40** is held in place by a plastic holder **92** that is polygonally-shaped (*e.g.* having a hexagonal shape) to prevent rolling of the holder and the abutment screw **40** when they are placed on a flat surface.

As shown in FIGS. 4A & 4B, in one embodiment designed for use with a standard dental handpiece (not shown), the drive tool **70** used to drive the implant **50** includes a socket **74** defining an opening **76** that is complimentary in shape to, and fits over, the abutment-mount **20**. Extending upwardly from the socket **74** is a fitting **72** that couples to the dental handpiece. The fitting **72** shown herein is designed to be coupled to an ISO 1791-1 standard dental handpiece.

In an alternate embodiment, shown in FIG. 5, a drive tool **170** for use with a ratchet (not shown) may also be used. The drive tool **170** comprises a body portion **184**, for engaging the ratchet, with a socket **174** extending downwardly therefrom and a finger knurl **182** extending upwardly therefrom. A recess **180** is defined by the body portion **184** for receiving therein an O-ring **186**. The finger knurl **182** may be supplied to give the implantologist the ability to start the implant by hand. The socket **174** defines a recess **176** that is complimentary in shape to the abutment-mount. The recess **176** may be provided with an o-ring **178** that acts as a spacer to allow the abutment-mount to be easily disengaged from the socket **174**.

As shown in FIG. 6, an elongated screw **190** may be supplied for use as an impression pin in the direct impression technique. The elongated screw **190** fits into the second longitudinal opening **34** of the abutment-mount **20** and has a drive structure **192**, such as an internal hex, for tightening and loosening the elongated screw **190**. In taking

an impression using the elongated screw **190**, impression material (not shown) is placed around the abutment-mount **20** and the elongated screw **190** after the implant **50** has been driven into the bone. The elongated screw **190** goes through the impression material and tray so that the drive structure **192** is not covered by the impression material. Once the impression material has set, the elongated screw **190** is removed from the implant **50** and the impression material and the emplaced abutment-mount **20** is removed from the patient's mouth. The grooves **32** on the abutment-mount **20** provide a surface which improves holding by the impression material. A healing screw (not shown) is affixed to the implant **50**.

While the bone is affixing the implant, a cast of the area around the implant **50** is made from the impression material. The abutment-mount **20** may fit into the cast, thereby allowing a dental prosthesis to be constructed with the abutment-mount **20** providing a base with the same relationship to the patient's mouth as it will eventually have when it is permanently affixed to the implant **50**. The drive tool engagement surface **28** provides a means of ensuring that the orientation of the abutment-mount **20** remains the same with respect to the implant **50** at all times. This function could also be accomplished by machining a marking onto the abutment-mount **20** to be used as a reference point. This ensures a near exact fit between the prosthesis, the abutment-mount **20** and the patients surrounding teeth.

The above embodiments are given as illustrative examples and are not intended to impose any limitations on the invention. It will be readily appreciated that many deviations may be made from the specific embodiments disclosed in this specification without departing from the invention. Accordingly it is intended to cover all such modifications as within the scope of this invention.

CLAIMS

What is claimed is:

1. An abutment-mount for a dental implant, having a longitudinally extending axis with a first end, an opposite second end and a peripheral surface, for delivery to a prepared site of a jawbone with an implant drive tool and means for securing a dental prosthesis to the dental implant, the dental implant also having a longitudinal axis, comprising:
   a. means for securing the abutment-mount to the implant;
   b. means for attaching the dental prosthesis to the abutment-mount adjacent the second end; and
   c. means for transferring rotational force from the implant drive tool to the implant through the abutment-mount.

2. The abutment-mount of Claim 1, wherein the abutment-mount tapers toward the first end, thereby forming a truncated cone.

3. The abutment-mount of Claim 1, wherein the implant has a crestal end defining a first longitudinal opening, a portion of the opening being threaded, and the abutment-mount defines a second longitudinal opening passing therethrough between the first end and the second end and wherein the securing means comprises a screw that is passable through the second longitudinal opening and engageable with the threaded portion of the first longitudinal opening in the implant.

4. The abutment-mount of Claim 1, wherein the implant has a first rotational engagement surface and the rotational force transferring means comprises:
   a. at least one implant drive tool engagement surface defined on the peripheral surface of the abutment-mount for engagement with the implant drive tool; and

b. a second rotational engagement surface on the abutment-mount adjacent the second end thereof and being matingly engageable with the first rotational engagement surface on the implant,

whereby when the implant drive tool imparts rotational force on the implant drive tool engagement surface, the second rotational engagement surface of the abutment-mount imparts rotational force on the first rotational engagement surface of the implant to screw the implant into the prepared site.

5. The abutment-mount of Claim 4, wherein the implant drive tool engagement surface is a chordal surface disposed on the peripheral surface of the abutment-mount.

6. The abutment-mount of Claim 5, wherein the abutment-mount has a longitudinal axis and the chordal surface is parallel to the longitudinal axis of the abutment-mount.

7. The abutment-mount of Claim 5, wherein the chordal surface is non-parallel to the longitudinal axis of the abutment-mount.

8. The abutment-mount of Claim 4, wherein the first rotational engagement surface is a first polygonal surface and the second rotational engagement surface is a second polygonal surface complimentary in shape to the first polygonal surface.

9. The abutment-mount of Claim 8, wherein the first polygonal surface is a male polygonal surface protruding from the crestal end of implant extending along the longitudinal axis of the implant and the second polygonal surface is an opening defined by the second end of the abutment-mount, the opening having an interior female polygonal surface complimentary in shape to the male polygonal surface.

10. The abutment-mount of Claim 8, wherein the first polygonal surface is a female polygonal surface extending along the longitudinal axis of the implant and the

second polygonal surface is a male polygonal surface, complimentary in shape to the female polygonal surface.

11. The abutment-mount of Claim 1, further comprising means for indicating to a user an alignment of the abutment-mount with the implant.

12. The abutment-mount of Claim 11, wherein the indicating means comprises a marking at a preselected location on the abutment-mount so that the marking is in alignment with a geometrical feature of the dental implant when the abutment-mount is properly coupled to the implant.

13. The abutment-mount of Claim 12, wherein the marking comprises a flat surface disposed on the peripheral surface of the abutment-mount.

14. An abutment-mount for a dental implant, having a longitudinally extending axis with a first end, an opposite second end and a peripheral surface, for delivery to a prepared site of a jawbone with an implant drive tool and means for securing a dental prosthesis to the dental implant, comprising:

a. means for securing the abutment-mount to the implant;

b. a groove defined by the peripheral surface and disposed circumferentially about the peripheral surface of the abutment-mount, thereby providing an attachment surface for cement used to affix the dental prosthesis to the abutment-mount adjacent the first end; and

c. means for transferring rotational force from the implant drive tool to the implant through the abutment-mount.

15. The abutment-mount of Claim 14, further comprising means for taking an impression of the abutment-mount.

16. A dental implant kit for use with an implant drive tool, comprising:

a. a dental implant having a crestal end defining a first engagement surface;

b. an abutment-mount, having a first end and an opposite second end, and a peripheral surface, the second end defining a second engagement surface matingly engageable with the first engagement surface, the peripheral surface defining a surface for engagement with the implant drive tool; and

c. means for securing the abutment-mount to the dental implant, thereby providing a platform for attachment of a dental prosthesis to the implant.

17. The dental implant kit of Claim 16, wherein the implant is a screw-form dental implant and the first engagement surface and the second engagement surface comprise polygonal rotational engagement surfaces.

18. The dental implant kit of Claim 17, wherein the implant has a longitudinal axis of rotation and the first engagement surface of the implant comprises a hexagonal protrusion concentric with the axis of rotation.

19. The dental implant kit of Claim 18, wherein the second engagement surface comprises a cavity defined by the second end of the abutment-mount, complimentary in shape to the hexagonal protrusion of the first engagement surface.

20. The dental implant kit of Claim 16, wherein the implant drive tool comprises:

a. means for affixing the drive tool to a drive mechanism; and

b. a socket, connected to the affixing means, engageable with the flat surface of the abutment-mount.

21. The dental implant kit of Claim 16, wherein the implant has a crestal end defining a first longitudinal opening, a portion of which is threaded, and the abutment-mount defines a second longitudinal opening passing therethrough along the longitudinal axis and wherein the securing means comprises a screw that is

passable through the second longitudinal opening and engageable with the threaded portion of the first longitudinal opening.

22. The dental implant kit of Claim 16, wherein the abutment-mount comprises a groove defined by the peripheral surface and disposed circumferentially about the peripheral surface of the abutment-mount, thereby providing an attachment surface for cement used for affixing the dental prosthesis to the abutment-mount.

23. A method of deploying and using a dental implant in prepared site of a bone, comprising the steps of:

a. placing the dental implant, having an abutment-mount coupled to the dental implant so as to transfer any rotational force received by the abutment-mount to the dental implant, into the prepared site;

b. applying rotational force to the abutment-mount with an implant drive tool, thereby rotating the dental implant into the prepared site;

c. removing the abutment-mount from the dental implant for a preselected period to allow bone growth into the dental implant, thereby affixing the dental implant to the bone;

d. re-coupling the abutment-mount to the implant and securing the abutment-mount to the dental implant; and

e. affixing a dental prosthesis to the abutment-mount.

24. The method of Claim 23, further comprising the step of taking a dental impression of the prepared site and the abutment-mount.

25. The method of Claim 24, further comprising the step of taking an impression of the implant and an area adjacent the mount of a patient.

26. The method of Claim 24, further comprising the step of crafting the dental prosthesis using the dental impression, so that the dental prosthesis will fit with

the abutment-mount and the surrounding teeth once the implant is in the prepared site in the bone.

27. A method of deploying and using a dental implant in prepared site of a bone, comprising the steps of:

a. placing the dental implant, having an abutment-mount coupled to the dental implant so as to transfer any longitudinal force received by the abutment-mount to the dental implant, into the prepared site;

b. applying longitudinal force to the abutment-mount with an implant drive tool, thereby driving the dental implant into the prepared site;

c. removing the abutment-mount from the dental implant for a preselected period to allow bone growth into the dental implant, thereby affixing the dental implant to the bone;

d. re-coupling the abutment-mount to the implant and securing the abutment-mount to the dental implant; and

e. affixing a dental prosthesis to the abutment-mount.

28. The method of Claim 27, further comprising the step of taking a dental impression of the prepared site and the abutment-mount.

29. The method of Claim 28, further comprising the step of crafting the dental prosthesis using the dental impression, so that the dental prosthesis will fit with the abutment-mount and the surrounding teeth once the implant is in the prepared site in the bone.

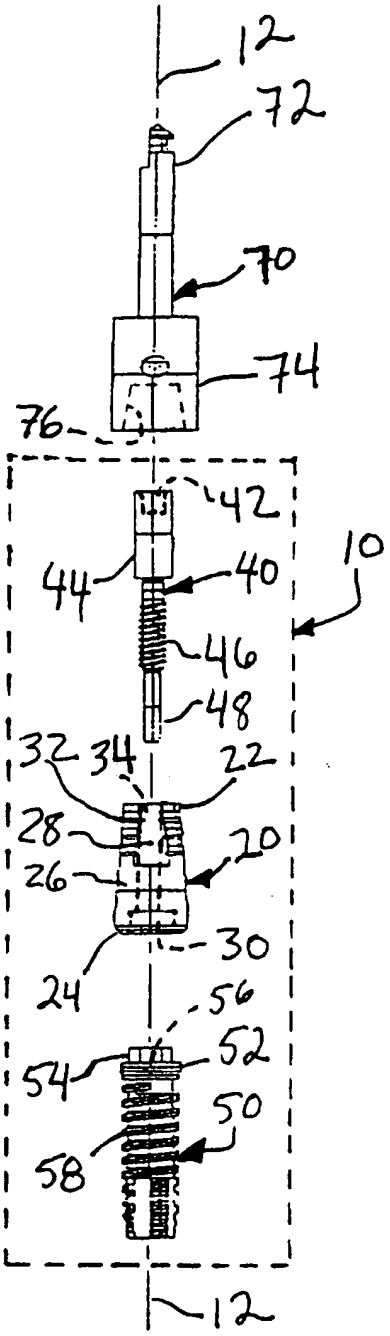
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FIG. 1

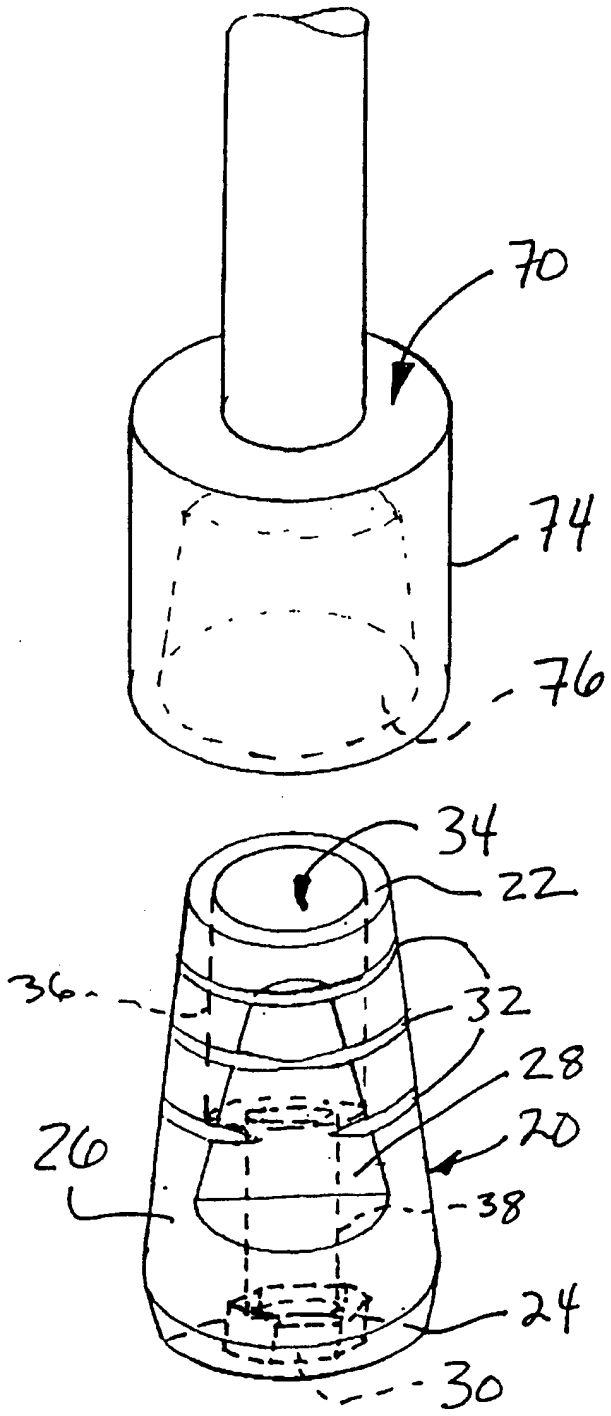

FIG. 2

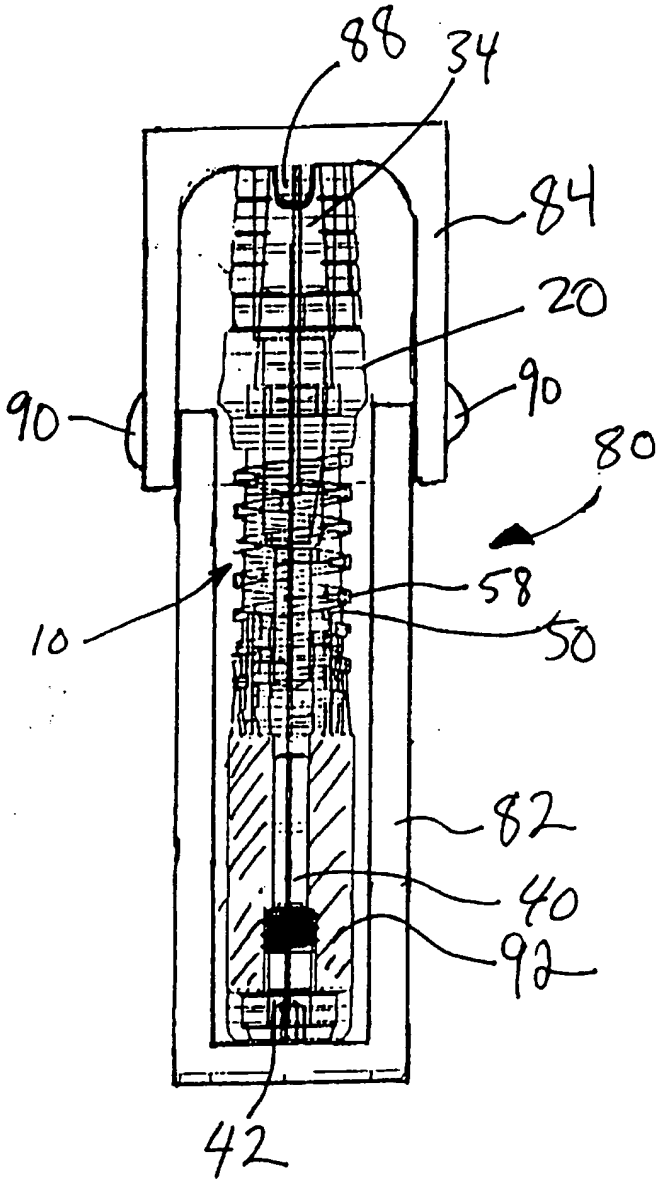

FIG. 3

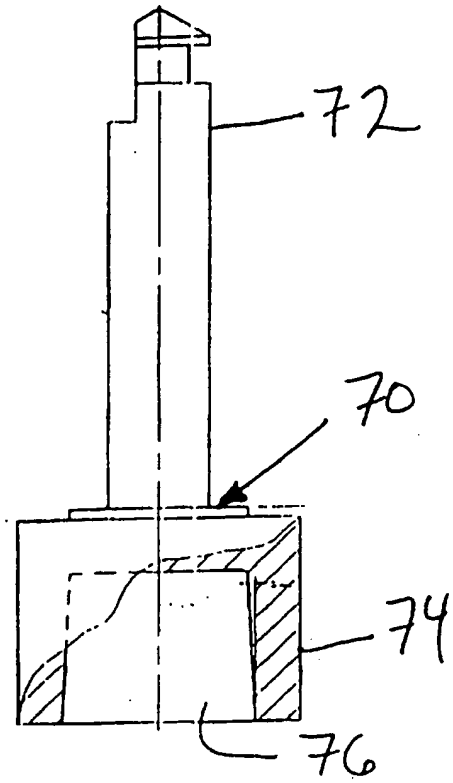

FIG. 4A

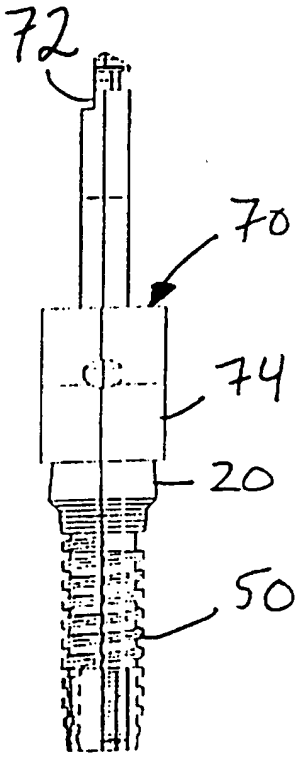

FIG. 4B

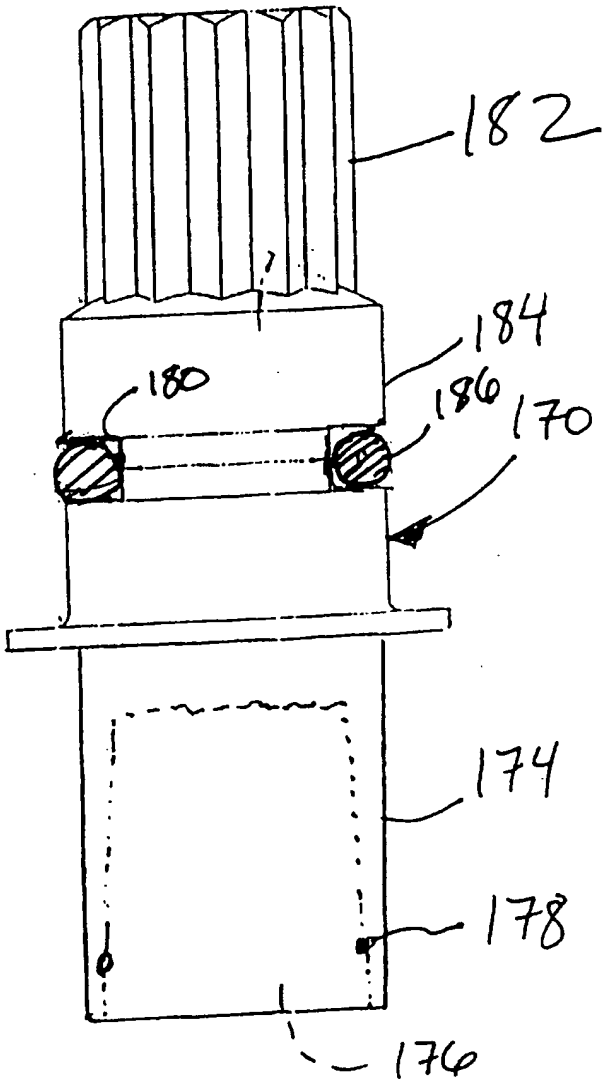

FIG. 5

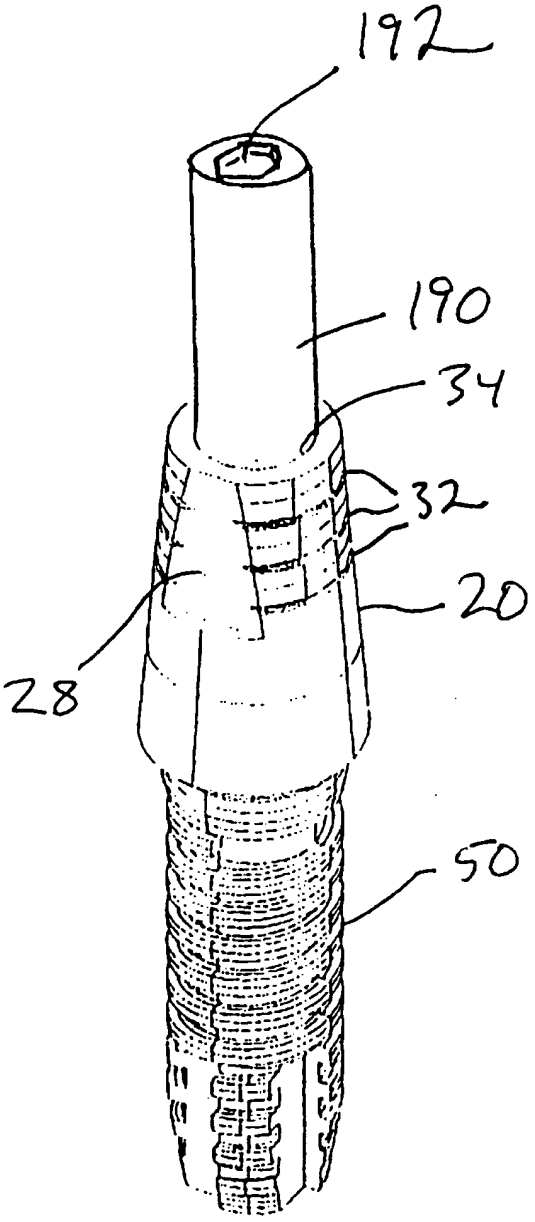

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/12673

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A61C 8/00
US CL :433/173
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 433/173, 174

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,863,383 A (GRAFELMANN) 05 September 1989, Fig. 1.	14, 15, 22
X --- Y	CA 2,042,992 A (PICHE et al) 02 November 1992, Fig. 1.	1-6, 8, 9, 11-13, 16-19, 21
X --- Y	US 5,213,502 A (DAFTARY) 25 May 1993, Figs. 1-8.	1-6, 8, 9, 11-13, 16-19, 21 --- 7, 10, 14, 15, 20, 22-29

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 23 OCTOBER 1997	Date of mailing of the international search report 17 NOV 1997
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer RALPH LEWIS Telephone No. (703) 308-0770

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/12673

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 5,312,254 A (ROSENLICHT) 17 May 1994, Fig. 1.	1, 3-6, 8-13, 16-21 --- 2, 7, 14, 15, 22-29